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EVALUATION OF TWO HEALTH EDUCATION STRATEGIES FOR TESTICULAR SELF-EXAMINATION

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We evaluated the effects of two health education teaching methods, a pamphlet based on a task-analyzed checklist and two professionally developed films, on the completeness, accuracy, and maintenance of testicular self-examinations (TSE). Subjects ($N = 48$) were videotaped while performing a TSE after training and at a follow-up visit. Direct observation of the tapes showed that checklist-based training resulted in more complete and longer TSEs ($p < .05$). Social validation ratings, however, suggested that physicians were unable to discriminate reliably the performances of subjects taught using the two methods. Accuracy of detection of simulated lesions on plastic models was also similar for the two groups. Adherence to TSE recommendations was high during the study, but declined across the follow-up period. Further study is needed to promote adherence to TSE and to document the effects of early detection on morbidity and mortality of testicular cancer.

DESCRIPTORS: health education, early cancer detection, health-related behavior, self-examination, adherence

Early detection of cancer can prevent death, disfigurement, and disability, and many cancer deaths can be attributed to delay in detection and thus in treatment (Bosl et al., 1981). Testicular cancer, treated early in its course, is one of the most curable cancers (Einhorn, 1981; Goldenring, 1985), and, unlike many other cancers, has early-stage symptoms that are readily detectable through testicular self-examinations (TSE). The combination of easily detectable early-stage symptoms and highly effective early-stage treatment suggests that there can be a sharp reduction in mortality from testicular cancer. Testicular cancer, however, is often not diagnosed until its advanced stages (Golbey, Reynolds, & Vugrin, 1979), and as many as 1,000 deaths occur from testicular cancer each year. Most of these men die in the prime of life, and testicular cancer accounts for a high number of potential years of life lost (Friman, Finney, & Leibowitz, 1989).

TSE skills are rarely taught and thus are rarely practiced (Cummings, Lampone, Mettlin, & Pontes, 1983; Goldenring & Purtell, 1984). Although cancer education literature states that TSE can be easily taught using pamphlets and films, these suggestions are based on expert opinion and clinical impression rather than on empirical studies (Friman & Finney, 1990). Health care providers who incorporate the teaching of TSE skills into routine health supervision visits do not have an experimentally validated method for teaching TSE.

Behavioral technology has been applied to teaching and maintaining the regular practice of breast self-examination (BSE) skills (Hall, Goldstein, & Stein, 1977; Mayer & Solomon, 1992). The approach to teaching BSE involves breaking the ex-

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amination down into its component steps (task analysis) and training women to conduct their self-exams in a sequential step-wise fashion (e.g., Hall et al., 1977). Similar technology, applied to teach men regular and effective TSE skills, may contribute to a reduction in morbidity and mortality from testicular cancer.

We previously evaluated a task-analyzed checklist for TSE developed from descriptions in pamphlets distributed by the American Cancer Society (1978), a teaching film produced by Norwich Eaton Pharmaceuticals (1976), and videotapes of men who participated in a previous study (Friman, Finney, Glasscock, Weigel, & Christophersen, 1986). The results were encouraging; men correctly performed significantly more TSE steps after checklist training. Several questions were left unanswered by the preliminary study, however. First, subjects were not trained to identify lesions, only the absence of lesions. Because no lumps were detected, we cannot be certain that subjects will be able to detect the presence of lumps after training. Thus, additional research is required to document that subjects can identify the presence as well as the absence of anomalies. Second, no methods to promote the regularity of TSE were included in the first study. Maintenance measures revealed that men were, on average, conducting self-examinations less than once a month, the frequency recommended by the American Cancer Society (1978). Thus, how to increase adherence to TSE recommendations is unknown. Third, although all posttraining tapes received increased satisfactory ratings from the urologist, they did not all receive the highest rating possible. For example, a urologist observed that some subjects did not completely examine the surface area of their testicles, leaving the possibility that lumps would go undetected. Thus, how to improve performance even further is a remaining question.

Various methods have been used to facilitate adherence to self-detection practices, the most common and effective of which may be high-contact reminder systems involving client and therapist (Mayer & Frederiksen, 1986). A problem with such reminder systems is the expense associated with increased therapist involvement. Other research has focused on social support interventions for increased adherence. Social support reduces the expense by substituting a "buddy" (e.g., friend, relative, or coworker) for the therapist and then promoting adherence through social support provided by the buddy (Janis, 1983; Mayer, Beach, Hillman, Kellogg, & Carter, 1991). The social support approach has been effective in increasing adherence to short- and long-term medical regimens (Meichenbaum & Turk, 1987), and may serve as an effective method for enhancing the performance of cancer detection strategies.

We compared the effectiveness of a task-analyzed checklist, a training film produced by the American Cancer Society (1975), and a training film produced by Norwich Eaton Pharmaceuticals (1976). Data from an earlier study (Friman et al., 1986) and pilot data for this study (Finney, 1987) showed that men perform very incomplete TSEs before training, with an average completion of 35% of required steps and an average duration of 16 s. Therefore, the present study did not include baseline TSEs to reduce discomfort reported by men when asked to perform a TSE without instruction and did not include a no-training control group to limit the number of subjects needed for the evaluation. We assessed posttraining TSE skills, lump detection using simulated model testes, the effectiveness of a social support intervention for increasing men's adherence to regular TSE, and the social validity (Wolf, 1978) of examination performances.

METHOD

Subjects

Forty-eight males between the ages of 18 and 25 years participated in the study. All were undergraduate students at a large southeastern state university and were recruited from undergraduate psychology courses. Participants who completed the study received extra credit for psychology courses.

Procedure

Subjects participated first in TSE training and then in the adherence intervention. They were then

scheduled for a 3-month follow-up. Specific feedback on TSE performance or lump detection was not provided during the study.

TSE training. Except for the differing health education procedures detailed below, all subjects received a standardized discussion of the study (i.e., purpose, procedures, benefits) that was detailed in the consent form. After agreeing to participate, each subject was then randomly assigned to the checklist or one of the two film training groups.

The procedures for the three groups were conducted individually for all subjects. Subjects in the checklist group were given an educational brochure developed by the authors (Friman et al., 1986). The brochure, which detailed a performance checklist for a TSE, was easily readable (94.4 on a 100-point readability scale; Flesch, 1948). Subjects were given time to read the checklist, and any questions were answered.

Subjects in the two film groups were instructed to view the film on testicular cancer. The ACS film group watched the American Cancer Society film, which was 5 min 27 s in length; the Norwich Eaton film group watched the other 10-min training film. Both films provided information on testicular cancer and showed a live model completing a TSE. Although the films did not provide a step-by-step checklist, complete instructions about TSE were included in both films. After the films were viewed, the investigators answered any questions the subjects had before the posttest videotape.

After training, subjects completed a posttest TSE that was videotaped. The checklist was not taken away from subjects during the posttest. During videotaping, only the subject was present in the filming room, and he was filmed from the navel to the mid-thigh area only. After the posttest, subjects conducted the simulated examination using an Adam C.S. Teaching Model (Omni Education, Somerville, NJ), a silicone model of human testicles, with two pairs of testicle models that included one normal testicle and three testicles with simulated lesions of varying sizes and locations. Subjects examined the models and marked a drawing of the testicle models to indicate the location of any detected lumps.

After the simulated examinations, all subjects were urged to schedule and attend an appointment with the university's student health service, where an examination by a physician was available to the student at no charge.

Adherence intervention. After all aspects of the TSE training were completed (i.e., completion of the TSE training, the posttest videotape, and the model examination), each subject then received TSE adherence-monitoring instructions. The subject was given 10 stamped postcards addressed to the investigators. The cards were dated in sequence for the 10 weeks after training. All subjects were instructed to mail in a postcard each week to indicate whether they had performed the TSE that week, and, if they had performed a TSE, whether they had detected any anomalies. Subjects were then randomized into the two adherence groups, either the social support or the control group.

The social support group included 8 subjects from the checklist group and 16 subjects from the film groups, for a total of 24 subjects. The control group consisted of 24 subjects, distributed similarly. A predetermined random sequence of group assignment was placed in sealed envelopes for the adherence study. The control group received specific instructions about conducting a weekly TSE. Subjects in the social support group identified a person (parent, sibling, or friend) who would be invited (by the subject) to remind them weekly to perform the TSE. A short written handout describing the role of the social support person was given to the subject to share with that person. Specific recommendations of ways to remind (e.g., choose a day of the week that you have regular contact with the subject) were included in the packet. The social support person was to be informed by the subject that his or her name would be given to the investigators when the first postcard was returned to the investigators.

All subjects received a letter at the end of the postcard follow-up period informing them of the recommendation that TSE be performed monthly (rather than weekly, which had been for the purposes of the study). An American Cancer Society brochure on TSE was also included with the letter.

Maintenance of TSE skills at follow-up. To assess maintenance of TSE skills, each subject was scheduled for a follow-up visit 3 months after his initial training. At the follow-up visit, subjects were asked to perform a videotaped TSE. Seventeen (35%) of the 48 subjects were unavailable for the follow-up posttest.

Measures

Completeness of TSE performance. The primary measure of completeness was TSE performance on the videotaped self-examinations. Performance measures were obtained by direct observation of the videotapes. The measure was the number of self-examination steps performed correctly; these included nine steps that were derived from previous research (Friman et al., 1986). To control for observer bias, the videotape segments for subjects from the two groups were randomly distributed on an extended play videocassette. The key to the random distribution, indicating the group assignment for each subject, was not available to the observers.

Duration of TSE. A second indication of completeness was the time that each subject spent conducting the TSE during the posttest videotape. Duration was measured by the observers using digital stopwatches.

Detection. The accuracy of self-examination training was assessed by a count of the number of lumps recorded on the drawings of the testicular models. The models included two pairs of testicles, one without a lump and three with one lump each. Subjects drew any detected lumps on a drawing that asked for indications of lumps for the front and back of each pair of model testicles, for a total of eight responses. A key that identified the location of all simulated lesions was used to score the detections. An accurate lump detection was scored if the subject's drawing was in the appropriate quadrant of the model and no lump was indicated in a testicle without a simulated lump.

Social validity ratings. To obtain a measure of the social validity of the effect of training strategies, four physicians viewed a sample of posttest videotapes. The physicians viewed a tape with the randomly ordered posttests without knowledge of subjects' group assignments. They rated each tape on a 1 (*very unsatisfactory*) to 5 (*very satisfactory*) scale.

Adherence. The measures of adherence to the recommended weekly TSEs were the number of postcards returned for each subject and the number of postcards that indicated the performance of a TSE for the week. Although the return of the postcard and the report indicated on the postcard may have been independent of the subject's actual conduct of the self-examination, more intrusive measures were not possible. Thus, for the purposes of the adherence assessment, return of postcards indicating TSE performance was considered to be an indication of adherence to the early-detection practice.

Interobserver reliability. Two observers independently scored 25% of the videotapes and drawings of lump detections for reliability estimates. An equal number of tapes and drawings were randomly chosen from each group. Reliability for completeness and detection scores were calculated by dividing the number of agreements by the number of agreements plus disagreements and multiplying by 100%. Interobserver reliability for completeness and detection scores was 96% and 100%, respectively. For duration, agreement was scored if the two observers agreed on the duration of the exam within a range of ± 1 s. Agreement was 100%.

RESULTS

Data on completeness, duration, and lump detection at posttest are shown in Table 1. TSEs of subjects in the checklist group were compared with those of subjects who viewed the ACS film and those who viewed the Norwich Eaton film using univariate analysis of variance (ANOVA). A significant effect was found for completeness of TSE (the number of steps completed), $F(2, 45) = 3.10$, $p < .05$. Post-hoc testing using the Tukey HSD test revealed no significant differences among the checklist group (mean number of steps completed = 6.1), the ACS film group (mean number of steps

Table 1
Completeness, Duration, and Detection Data for the Three Groups

Measure	Group		
	Checklist	ACS film	Eaton film
	M (*SD*)	*M* (*SD*)	*M* (*SD*)
Completeness of TSE (no.)	6.1* (1.6)	4.9 (.71)	4.9 (2.1)
Duration of TSE (in seconds)	96** (48)	55 (23)	48 (19)
Detection of lumps (no.)	4.6 (1.1)	4.6 (1.3)	3.8 (1.5)

* $p < .05$; ** $p < .001$.

completed = 4.9), and the Eaton film group (mean number of steps completed = 4.9).

A significant univariate ANOVA was also found for duration of TSE, $F(2, 45) = 9.70, p < .0005$. Post-hoc Tukey HSD tests revealed that the checklist group had significantly longer TSEs (M = 96 s) than both the ACS film group (M = 55 s) and the Norwich Eaton film group (M = 48 s); the difference between the two film groups was nonsignificant. A Pearson r correlation coefficient showed that completeness and duration of TSEs were significantly correlated, $r = .39, p < .005$. Table 1 also shows number of lumps detected. The univariate ANOVA for the number of lumps accurately detected on the model of human testicles showed no significant differences among the three groups, $F(2, 45) = 2.01, p > .10$.

Social validity was based on physicians' ratings of the videotaped performances of representative subjects from checklist (n = 5) and film (n = 5) groups and was found to be similar for both groups. On the 1 (*very unsatisfactory*) to 5 (*very satisfactory*) rating scale, checklist subjects received a mean rating of 4.6 (SD = .46), and film subjects received a mean rating of 4.0 (SD = .58).

At follow-up, 9 subjects from the checklist group and 22 subjects from the film groups returned for the second filmed TSE. Subjects who returned for the follow-up did not differ from the three groups in terms of posttest duration and completeness measures. The checklist group completed an average of 4.7 steps (SD = 1.6) with an average duration of 58.3 s (SD = 29.1). The film groups completed an average of 4.0 steps (SD = 1.9) with an average duration of 34.1 s (SD = 22.3). A repeated measures ANOVA showed a significant main effect for time, $F(1, 29) = 6.22, p < .05$, but no significant effects for group ($p > .10$) or for the group × time interaction ($p > .10$). Both groups showed declines in number of steps performed at follow-up. For duration of TSE, a similar main effect was found for time, $F(1, 29) = 26.6, p < .001$, but no significant effects were found for group or the interaction ($ps < .25$), with a similar decline in duration for both groups.

Correlational analyses revealed a moderate but nonsignificant relation between the number of TSE steps completed at posttest and at follow-up, $r = .27, p < .06$. The relation between duration of TSE at posttest and at follow-up was high and statistically significant, $r = .80, p < .0001$.

Adherence to TSE recommendations was compared for subjects in the social support (n = 24) and control (n = 24) conditions. The number of postcards returned by the social support group (M = 7.5, SD = 2.7) was not significantly different from that of the control group (M = 6.9, SD = 3.8), $t(46) = .83, p > .35$. The number of self-reported TSEs across the 10-week follow-up by the social support group (M = 6.1, SD = 2.8) was also not significantly different from that of the control group (M = 6.9, SD = 2.8), $t(46) = .98$, $p > .30$.

To assess the relation between reported practice of TSE and the actual performance (with a prediction that greater practice would be associated with better performance), we calculated a Pearson r correlation coefficient for the number of reported TSEs during the interval between posttest and follow-up TSE performance and the completeness of

TSEs at the 3-month follow-up assessment. The relation was moderate and statistically significant, $r = .37, p < .05$.

DISCUSSION

Effective, experimentally validated training methods are available for teaching and maintaining young men's performance of TSE skills. A checklist based on a task analysis (Friman et al., 1986) resulted in performance of more TSE steps and TSEs of longer duration than did professionally produced films also designed to teach TSE. The performances of TSE after training with the two different methods, however, were not distinguished by physician raters, whose ratings suggested similarly high social validity for both methods. The different teaching methods were also unrelated to differential performance on the lump-detection task using the simulated testicular models. Therefore, objective measures indicate that the checklist method results in more complete and longer TSEs, but the clinical advantage for the checklist has not been established in terms of physicians' ratings and detection of simulated lumps.

The study also evaluated adherence to TSE recommendations. Adherence was high for subjects who received general adherence instructions and those who received specific social support instructions to recruit a person who could encourage continued performance of TSEs across time. Reasons for the lack of effect for the social support intervention may include the relatively simple intervention; more potent social support or reinforcement-based interventions may produce higher adherence. Another reason might be the topic of the study, which for most subjects was the first time they had learned about testicular cancer. High adherence in both groups, therefore, would require larger sample sizes to detect small differences between groups. Furthermore, follow-up occurred after a relatively short period of time for assessment of adherence. Additional study is needed to determine whether adherence to early cancer-detection practices is high in college populations, which was found recently in a study of adherence to a medical regimen (Putnam, Finney, Barkley, & Bonner, 1994). An additional study question is how to promote long-term maintenance of skills and frequency. The repeated measures analysis showed a significant decrease across time. More effective strategies to enhance long-term adherence and skill maintenance (e.g., mastery training, prompting, motivation) are needed for this and other early cancer-detection strategies (cf. Mayer & Solomon, 1992).

The present study used direct observation to evaluate the training outcomes associated with the two methods. This methodological aspect represents an important step in the validation of early cancer-detection strategies, given that most studies have relied on knowledge measures, reports of intentions, and self-reported performance after training (e.g., Ganong & Markovitz, 1987; Vaz, Best, Davis, & Kaiser, 1989). Therefore, physicians and health educators can be more confident of the outcomes associated with training in early cancer detection using the task-analyzed checklist or one of the films validated in the present study.

There is, however, some controversy about teaching TSE to all young men (Goldbloom, 1985; Goldenring, 1985). In the United States, there are more than 50,000,000 adolescent and adult males between the ages of 15 and 35 years, the highest risk group; a health education program for this large number of men to detect a rare disease like testicular cancer may not be cost effective. Men at specific risk for the disease within this age group comprise a much smaller number; thus, health education for this at-risk group may be a more cost-effective health education approach. Men with histories of testicular anomalies are especially susceptible to testicular cancer (Pottern et al., 1985). For example, the risk of testicular cancer for men with cryptorchidism (undescended testes) can be 40 times as high as it is in men with normally descended testes (Schottenfeld et al., 1980). Thus, TSE training may be targeted for men who are at increased risk for developing testicular cancer.

The issue of health education for testicular cancer has been addressed by American and Canadian task forces, which have produced guidelines for the content of health supervision visits. The American

Academy of Pediatrics (1988) recommends TSE training as a routine part of adolescent health care, whereas the Canadian Task Force on the Periodic Health Examination (1984) recommends that TSE be included only for those at risk for the disease. Although we favor the more conservative Canadian position, a position on either side of the issue is premature, given the absence of a demonstrated relationship between early cancer-detection practices and the reduction of morbidity and mortality. A related issue is the inclusion of this topic in most high school health textbooks and the availability of curricula for teaching TSE (e.g., Wisconsin Cancer Information Service, 1984). If most high school students are to be taught TSE routinely, it is important to have an effective method of TSE training incorporated into the high school health curricula.

The results of this study serve as a guide for larger studies to determine the effects of regular TSE on early detection of testicular cancer and to determine if there are high-risk groups for whom TSE training should be targeted. The findings indicate that appropriate TSE skills can be trained and maintained, although neither of the training methods we investigated produced optimal performance for all subjects. Further study is needed to identify effective methods that result in maximally accurate and sufficiently frequent TSEs and to determine if regular early-detection activities will reduce the morbidity and mortality associated with testicular cancer.

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